Claims:

1. A method for selecting an optimal path in an ATM network having a plurality of links where, for each of the links, Link State Parameters are defined including a group of non-D parameters comprising at least AW, and two D-parameters being MaxCTD and CDV, the method being performed by the following steps:

receiving a user's request for selecting a path between a source point and a destination point in said network,

obtaining, from the user's request, two limitations of end-to end QoS parameters of the path to be selected, one of the limitations being $MaxCTD_{QoS}$ and the other limitation being CDV_{QoS},

normalizing the D-parameter CDV by symbolically modifying the ATM network so as to make CDV constant for all links of the modified network,

constructing a link cost equation comprising a first member reflecting influence of the D-parameter MaxCTD on the cost, and a second member reflecting influence of the group of non-D parameters on the cost, the members being taken with respective relative importance weights,

based on said equation, calculating links' costs of the modified network, for one or more values of a ratio between the relative importance weight of the first member and that of the second member, and forming a data base of link costs for each of said one or more ratio values;

applying a shortest path algorithm to each of the formed data bases to determine one or more conditional paths for the respective one or more data bases, said algorithm being capable of selecting a minimal cost path among paths limited by a given number of links to satisfy said limitation CDV_{QoS};

calculating one or more cumulative values $MaxCTD_{cum}$ of the D-parameter MaxCTD for said respective one or more determined conditional paths, and

judging about the optimal path, based on comparing said one or more cumulative values $MaxCTD_{cum}$ with the limitation $MaxCTD_{QoS}$.

2. The method according to Claim 1, wherein for normalizing the D-parameter CDV, the following steps are performed:

selecting a value of minCDV such, that values of CDV parameter of the network links could substantially be represented as respective k-fold multiples of said minCDV, where k is integer;

building a modified network by symbolically replacing each of the links, having CDV value of k*minCDV where k>1, with "k" fictitious component links each having the CDV value equal to said minCDV so, that the CDV value of each replaced link be equal to a cumulative value of corresponding parameter values of the "k" fictitious component links;

assigning to said "k" fictitious links values of remaining link state parameters in a manner providing equivalence of said "k" links to the replaced link from the point of each of the link state parameters.

3. The method according to Claim 1, wherein the step of constructing the link cost equation comprises defining a relative importance weight of the member associated with said D-parameter as R, and a relative importance weight of the member associated with the non-D parameters as (1-R).

4. The method according to Claim 1, wherein the step of calculating links' costs of the modified network further comprises:

sequentially selecting one or more R values in the range $0 \leq R \leq 1$ and calculating for each of them link costs of all the links of the modified network using said link cost equation, and

forming a data base of link costs for each of said one or more R values.

5. The method according to Claim 1, wherein the step of applying a shortest path algorithm to each of the formed data bases comprises:

applying a Bellman-Ford-type algorithm to each of the data bases, for defining said conditional shortest path between the source point and the destination point, while limiting a number of links in said path to $H = CDV_{QoS}/minCDV$, thereby obtaining the conditional shortest path both having a minimal sum of the cost values of links forming said path, and satisfying the end-to-end limitation CDV_{QoS}.

6. The method according to Claim 1, wherein the step of calculating the cumulative value $MaxCTD_{cum}$ of the D-parameter MaxCTD for each of said conditional shortest paths comprises summing MaxCTD values of the links forming said path.

7. The method according to Claim 1, wherein the judgement about the optimal path is performed by

comparing said one or more cumulative values $MaxCTD_{cum}$ with the limitation $MaxCTD_{QoS}$,

checking whether there exists a particular value R* of the relative importance weight R at which the determined conditional shortest path has the cumulative value $MaxCTD_{cum}$ equal to, or smaller but substantially close to said $MaxCTD_{QoS}$ limitation,

if yes, the conditional shortest path determined for said R* is considered the optimal path,

if no, the optimal path does not exist for said limitations.

8. The method according to Claim 3, comprising choosing an initial value of R in the range $0 \le R \le 1$, thereby selecting a ratio between said relative importance weights ;

- determining the cumulative value $MaxCTD_{cum}$ of the conditional shortest path for the selected ratio,
- if the cumulative value $MaxCTD_{cum}$ does not exceed the required limitation $MaxCTD_{QoS}$, decreasing the selected value of R within said range,
- if the cumulative value $MaxCTD_{cum}$ exceeds the required limitation $MaxCTD_{QoS}$, increasing the selected value of R within said range,
- repeating the step of determining said $MaxCTD_{cum}$ up to either obtaining, at said particular value R*, the conditional path being said optimal path, or concluding that the optimal path does not exist.

9. The method according to Claim 3, wherein values of R are selected in the following order:

- selecting R=0;
- if the cumulative value $MaxCTD_{cum}$ does not exceed the required limitation $MaxCTD_{QoS}$, considering the defined conditional shortest path to be optimal,
- if the cumulative value $MaxCTD_{cum}$ exceeds the required limitation $MaxCTD_{QoS}$, selecting R=1, and determining the cumulative value of $MaxCTD_{cum}$ for R=1;
- if the cumulative value $MaxCTD_{path}$ still exceeds the required $maxCTD_{path}$, the optimal path does not exist;

- if the cumulative value $MaxCTD_{cum}$ for R=1 does not exceed the required limitation $MaxCTD_{QoS}$, selecting a number of R values in the range 0<R<1, up to obtaining, at a particular value R*, the cumulative value $MaxCTD_{cum}$ equal to, or smaller but substantially close to said required $maxCTD_{QoS}$ parameter, thereby considering the conditional shortest path defined for said R* to be the optimal path.

10. The method according to Claim 1, wherein said values of a ratio are selected by applying a method of secants to a function $MaxCTD_{cum}$ =f(R), wherein said function being a non-increasing monotonous function.

11. A method for optimized path selection in an ATM network having a plurality of links where, for each of the links, Link State Parameters are defined including a group of non-D parameters comprising at least AW, and including two D-parameters MaxCTD and CDV, the method comprises steps of:

obtaining, from a user's request for selecting a path between a source point and a destination point in said network, two limitations of end-to end QoS parameters of the path to be selected, one of the limitations being $MaxCTD_{QoS}$ and the other limitation being CDV_{QoS},

selecting a value of minCDV such, that values of CDV parameter of the network links could substantially be represented as respective k-fold multiples of said minCDV, where k is integer;

building a symbolic modified network from said network by symbolically replacing each of the links, having CDV value of k*minCDV where k>1, with "k" fictitious component links each having the CDV value equal to said minCDV so, that the CDV value of each

replaced link be equal to a cumulative value of corresponding parameter values of the "k" fictitious component links;

assigning to said "k" fictitious links values of remaining link state parameters in a manner providing equivalence of said "k" links to the replaced link from the point of each of the Link State Parameters;

defining an importance weight for the D-parameters as R, and that for the non-D parameters as (1-R);

sequentially selecting one or more R values in the range $0 \leq R \leq 1$ and determining for each of them a cumulative value $MaxCTD_{cum}$ of a conditional shortest path in order to obtain, at a particular value R* of the importance weight R, the cumulative value $MaxCTD_{cum}$ equal to, or smaller but substantially close to said $MaxCTD_{QoS}$ limitation;

wherein the step of determining the cumulative value $MaxCTD_{cum}$ of the conditional shortest path comprises, for each selected value of R:

- calculating a cost for each link of said modified network by using a weighed equation comprising a first member, with importance weight R, reflecting influence of the D-parameter MaxCTD on the cost, and a second member, with importance weight (1-R), reflecting influence of said group of the non-D parameters on the cost;
- applying a Bellman-Ford-type algorithm to the modified network represented by a plurality of its links' costs, for defining said conditional shortest path between the source point and the destination point, while limiting a number of links in said path to $H = CDV_{QoS}/minCDV$, thereby obtaining the conditional shortest path both having a minimal sum of the cost values of links forming said path, and satisfying the end-to-end limitation CDV_{QoS};
- calculating said cumulative value $MaxCTD_{cum}$ of the conditional shortest path, by summing maxCTD values of the links forming said path;

if said particular value R* exists, considering the corresponding to it said conditional shortest path to be the optimal path.

12. A computer software product for selecting an optimal path in an ATM network having a plurality of links where, for each of the links, Link State Parameters are defined including a group of non-D parameters comprising at least AW, and two D-parameters being MaxCTD and CDV, and said ATM network being represented in the form of a network database;

the product comprising a computer-readable medium in which program instructions are stored, which instructions, when read by a computer, cause the computer to:

obtain, from a user's request on selecting a path between a source point and a destination point in said network, two limitations of end-to end QoS parameters of the path to be selected, one of the limitations being $MaxCTD_{QoS}$ and the other limitation being CDV_{QoS},

normalize the D-parameter CDV by modifying the ATM network so as to make CDV constant for all links of the modified network, thereby forming a modified network database;

activate a subroutine of a link cost equation comprising a first member reflecting influence of the D-parameter MaxCTD on the cost, and a second member reflecting influence of the group of non-D parameters on the cost, the members being taken with respective relative importance weights,

using said equation subroutine, calculate links' costs of the modified network, for one or more values of a ratio between the relative importance weight of the first member and that of the second member, and form a data base of link costs (cost DB) for each of said one or more ratio values;

apply a subroutine of a shortest path algorithm to each of the formed cost DBs to determine one or more conditional paths for said one or more cost DBs respectively, said algorithm being capable of selecting a minimal cost path among paths limited by a given number of links to satisfy said limitation CDV_{QoS};

calculate one or more cumulative values $MaxCTD_{cum}$ of the D-parameter MaxCTD for said respective one or more determined conditional paths, and

judge about the optimal path, based on comparing said one or more cumulative values $MaxCTD_{cum}$ with the limitation $MaxCTD_{QoS}$.